REMARKS

By this amendment, claims 1-4 have been revised to place this application in condition for allowance. Currently, claims 1-12 are before the Examiner for consideration on their merits.

Claims 1-4 have been revised to correct a typographical error so that the alloying element of Cu is properly identified. Since this amendment does not change any issues before the Examiner, its entry is respectfully requested, even if an advisory action is issued.

Turning now to the prior art rejection, Applicants traverse the rejection on the grounds that the Examiner has not established the obviousness of the claimed invention.

In traversing the rejection, the arguments are set out below in combination with a discussion of the invention.

INVENTION

The technical concept of the invention can be found in paragraphs [0018] to [0022] of the instant application's publication. That is, the inventors have discovered that a martensitic steel can have excellent corrosion resistance if the amounts of carbides are reduced and the steel is processed to have one of a hot finished condition, an as quenched condition, or low temperature tempered condition.

These improvements are attained by having the claimed combination of copper and molybdenum in the alloy so that copper sulfide and molybdenum sulfide provide a very fine dense layer onto the chromium oxide file, and therefore, a protection effect on the chromium oxide film is provides, thus obtaining resistance to sulfide stress corrosion cracking.

Secondly, almost no $M_{23}C_6$ type carbide exists as a result of the as-quenched or as hot-worked state. Without the precipitation of the $M_{23}C_6$ type carbide, improvements are realized in the resistance to sulfide stress corrosion cracking.

Thirdly, an increase in hardness of the steel provides a proper resistance to corrosive wear.

The condition of the steel to attain the benefits can be found in paragraphs [0074] to [0076] of the publication and can be described as follows:

1) after hot working, wherein subsequent to heating to the temperature of Ac_3 point or more, the quenching treatment or air cooling is carried out;

2) the steel is cooled to room temperature, and then heating to the temperature of Ac_3

point or more is performed following by a quenching treatment or air cooling;

3) after the cooling step, tempering can be performed just that it is a low temperature tempering step, i.e., 400 °C or lower. In this regard, it should be noted that Table 2 in the Examples section shows a tempering of 250 °C for a 30 minute duration as being within the invention, whereas a temperature of 600 °C and 30 minutes is outside the scope of the invention.

ARGUMENTS

In the rejection, the Examiner takes the position that Jung establishes a *prima facie* case of obviousness against the claims because of overlap of the claimed alloying ranges.

With regard to the formula, the Examiner contends that since Jung teaches a range of Mo and Cu that could fall within the formula, one of skill could use Mo and Cu amounts so as to satisfy the formula.

The Examiner contends that the hardness would be inherent as would be the limitation regarding the amount of carbides at the grain boundaries in the prior austenite. In this regard, the Examiner points to the tempering treatment of Jung and col. 4, lines 42-49.

It is contended that the Examiner's rejection is flawed for a number of reasons and that the rejection must be withdrawn. The Examiner is mixing allegations of obviousness and anticipation in the rejection, and this alone makes it improper. That is, the Examiner is saying that one of skill in the art would be motivated to arrive at the invention, and then conclude that the advantages of the invention tag along with it.

What Applicants have done here is to develop an improved steel with improved properties by close control of composition and processing and the use of a mechanism entirely different from Jung. Whereas Jung uses precipitation hardening, Applicants use the dense layer of sulfides as noted above, thereby providing the resistance to sulfide stress cracking. Practicing a process which avoids the precipitation of $M_{23}C_6$ also allows this resistance to be obtained.

The improvements associated with the invention are shown through comparative testing in the specification. The invention of Jung is entirely different from that of Applicants. In spite of this, the Examiner insists that, since there is similarity in composition (which there is not as shown below), one would arrive at the invention of Applicants. It is submitted that one would not get to the instant invention through the teachings of Jung, and the unexpected improvements shown in the specification regarding resistance to sulfide stress corrosion cracking, corrosion improved wear, and local corrosion resistance demonstrate the claims 1-4 describe an invention

that it not taught or suggested by Jung.

The more specific arguments are set forth below under their respective headings.

TEMPERING

Critical to the Examiner's rejection is the assumption that one of skill in the art would be motivated to use the claimed ranges and also practice a tempering step that would result in the claimed carbide amount. Applicants strenuously contend that one of skill in the art would not be motivated to use a low temperature tempering step as is done in the invention to obtain the desired carbide amounts.

Turning to Table 2 of Jung, and the description in col. 5, lines 55-61, the Inventive Examples 1-8 show higher yield strength compared to the Comparative Examples 1-4 of the same table. At the same time, the elongation values are similar. For example, Example 6 has a yield strength of 110.2 kgf/mm^2 and an elongation of 11%.

The same steel for Example 6 is then tested for the effect of tempering temperature, see col. 6, beginning at line 53. The results of this test are shown in Figures 1 and 2. Figure 1 shows the effect on yield strength for varying tempering temperature and Figure 2 shows the effect on elongation for varying tempering temperature. Jung also notes that the effect for Example 6 in Figures 1 and 2 is the same for the other examples.

What Figures 1 and 2 tell one of skill in the art is that to maintain the yield strength for Example 6 as shown in Table 2, one must use a tempering temperature range between 450-550 °C. Similarly, high tempering temperatures are required to maintain the 11% elongation for Example 6. This means that Jung suggests a high temperature tempering temperature to attain the desired properties in his steel. Carrying out a low temperature temper results in properties which are considered unacceptable in light of Table 2.

What Jung teaches one of skill in the art is that high temperature tempering is required, and Jung does not suggest processing a steel without tempering or at low temperature tempering as is required for the invention to obtain the claimed properties. In fact, Jung teaches away from the absence of tempering or a low temperature tempering step. This teaching away is further substantiation that the invention is not obvious based on Jung.

In the rejection, the Examiner is essentially saying that since Jung discloses a range of tempering temperatures, including one that falls below 400 °C, one of skill in the art would be motivated to develop the claimed ranges of alloying elements and process the steel using a low

tempering temperature treatment. This allegation flies in the face of the teachings of Jung and cannot be derived from the teachings of this reference.

Jung achieve his aim through precipitation hardening, particularly Cu and W, see col. 5, line 8 and col. 3, lines 42-43. In addition, Figures 1 and 2 indicate that high temperature tempering is required to maintain the levels of strength and elongation as shown in Table 2. Thus, one of skill in the art would not be motivated to manipulate the teachings of Jung and arrive at the steel and its properties as defined in claims 1-4. To draw any other conclusion is the use of hindsight in light of Applicants' disclosure.

HARDNESS

The Examiner conclusion that the overlap in composition results in the claimed hardness is refuted by the evidence in the specification. In Table 3, Examples 10, 18, and 24, alloys falling within the claimed ranges do not exhibit the claimed hardness level. This alone means that the Examiner cannot conclude that the claimed hardness levels are necessarily present. The Examiner is called upon to provide a further basis to make this contention in any subsequent Office Action.

PRECIPITATION

As noted above, Jung uses the function of M_2C carbide precipitation to attain his desired properties of better mechanical strength at high temperature, tempering resistance, and pitting corrosion resistance. This is attained using W and Cu, and the high end tempering temperature becomes indispensable for affecting the precipitation hardening function and its attendant results.

The invention goes down a completely different road. A steel is made using an entirely different concept of controlling composition and processing conditions so that the desired properties can be obtained, including that the amounts of carbide in prior austenite grain boundaries are not more than 0.5% by volume.

Given the fundamental difference between the teaching of Jung and the instant invention regarding Jung's use of precipitation hardening, and the invention's control of composition and processing, Jung does not obviate the invention.

Moreover, the results in Table 3 show that only the alloys that fall within the claimed range of alloying elements, and are processed with either no tempering or low temperature tempering have the claimed combination of hardness and carbide amount. As importantly, the

steels of the invention have all three qualities of resistance to local corrosion, corrosion wear and sulfide stress cracking. These results are surprising and not evident from the teachings of Jung. The evidence in the specification clearly rebuts any contention that Jung teaches or suggests the invention. Applicants are able to obtain three excellent corrosion properties, resistance to sulfide stress cracking, local corrosion resistance, and corrosion wear resistance. The evidence shows that alloys without the claimed composition and the claimed hardness and carbide amount do not exhibit the surprising combination of all three. Jung does not refute the unexpected combination of corrosion resistance, and any alleged *prima facie* case of obviousness based on this reference is effectively rebutted.

COMPOSITION

While the Examiner alleges that the composition of Jung and that which are claimed are the same, the facts show otherwise. That is, Jung is directed to a tungsten-containing alloy, and tungsten is essential for Jung's properties. In contrast, the present invention does not involve tungsten (W) in any way.

More particularly, Jung teaches in claim 1 that W is present in an amount of 0.5-6.0%. W is also present in each of Examples 1-8 in the EXAMPLES section, showing amounts ranging from 0.5 to 3.2 wt.%. Col. 3, lines 40-50 of Jung also show that the presence of W is important in attaining the desired properties. Table 2 shows that the presence of Mo and absence of W produces an inferior product in terms of hardness, yield strength, and elongation. From this, it can also be inferred that W has a material effect on the properties of the alloy of Jung, and that one of skill in the art would not taught to remove W from the alloy. This is another reason why Jung cannot be used under 35 U.S.C. § 103(a).

HIRAMATSU

The reliance on Hiramatsu is noted. However, this reference does not make up for the deficiencies noted above in Jung. Hiramatsu is totally silent on the features of the invention. Therefore, even if Hiramatsu were combined with Jung, the invention is still not taught.

SUMMARY

It is respectfully contended that Jung does not establish a *prima facie* case of obviousness against the invention. Jung employs a fundamentally different approach than that of the

invention, and the mere similarity in composition is not enough for the Examiner to conclude obviousness. The specification clearly demonstrates that the composition and processing are critical to attaining the claimed hardness and carbide amount, and these characteristics are neither inherent in the Jung nor attainable from Jung's teachings. Consequently, the rejection as applied to independent claims 1-4 should be withdrawn.

Lastly, another PTO-1449 is attached showing the corrected citation for 06100935 as a Japanese publication not an EPO publication. It is requested that the Examiner re-initial this corrected PTO-1449 so that the Japanese publication is correctly identified on the front face of the patent.

Accordingly, the Examiner is respectfully requested to examine this application and pass claims 1-12 onto issuance.

If the Examiner believes that an interview with Applicants' attorney would be helpful in expediting prosecution of this application, the Examiner is respectfully requested to telephone the undersigned at 202-835-1753.

The above constitutes a complete response to all issues raised in the Office Action dated March 1, 2005.

Again, reconsideration and allowance of this application is respectfully requested.

Please charge any fee deficiency or credit any overpayment to Deposit Account No. 50-1088.

Respectfully submitted,
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